SECTION 611

MANHOLES, DROP OR CURB INLETS, AND JUNCTION BOXES

611.01. DESCRIPTION.

This work shall consist of the construction of manholes, drop or curb inlets—Including special curbs—junction boxes, or similar structures in accordance with the Plans and these Specifications, and in reasonably close conformity with the lines, grades, and elevations shown on the Plans or established by the Engineer.

The Contractor shall have the option of furnishing precast concrete units in lieu of brick masonry or cast-in-place concrete structures unless otherwise shown on the Plans.

611.02. MATERIALS.

(a) **General.** Materials shall meet the requirements specified in the following Subsections of Section 700 - Materials:

Portland Cement	701.02
Mortar Sand	701.05
Clay or Concrete Brick	714.01 & 714.02
Reinforcing Steel	723.01 & 723.02
Structural Steel	724
Steel Castings	725.03
Iron Castings	725.04
Precast Manholes	726.02

Portland cement concrete shall be Class A and shall meet the requirements of Subsection 701.01.

Concrete brick or precast concrete block units shall not be used in the construction or rebuilding of sanitary sewer manholes.

Construct manholes, inlets, and junction boxes of approved design with precast concrete units. All precast structures with slab tops which may be subject to traffic shall meet H-20 loading requirements.

Use Class A concrete for precast units. The coarse aggregate shall conform to Subsection 701.06. Coarse aggregate for thin section concrete shall be Size No. 7. Alternate material shall be concrete referenced in AASHTO M 199 (ASTM C 478).

Reinforcing steel for precast concrete units shall conform to the requirement of Subsections 723.01, 723.02 and 723.03. Alternate material shall be steel referenced in AASHTO M 199 (ASTM C 478).

(b) **Portland Cement Mortar.** With brick masonry, use mortar composed of one part portland cement and two parts mortar sand by volume, mixed with sufficient water to form a plastic consistency. You may use hydrated lime not to exceed 10 percent by volume of the amount of cement, but when used, it must added to the cement first and in such proportions that the mortar will be considered as cement.

(c) **Accessories.** Accessories—such as bolts, rivets, spacers, small I-beams, channels, and plates used for assembling or supporting frames, gratings, or covers—shall be of first quality standard commercial material free from defects which may affect their value for the service intended.

611.03. EQUIPMENT.

Specialized equipment required for off-loading, handling, and placement must be capable of safely handling the largest single unit and/or subassemblies. Provide lift holes or lift rings in each unit at the manufacturer's discretion; all lift devices and/or connection points shall be safe for handling above ground and in the inlet excavation.

611.04. CONSTRUCTION METHODS.

(a) **Concrete.** In the construction of concrete bottoms for manholes and inlets, round the concrete to the dimensions and shape, and trowl and retrowel the surface until a uniform, smooth, and impervious hard fanned finish is obtained.

All exposed concrete edges shall have a minimum 1/2 inch (13 mm) chamfer, or an approved rounded edging. All exposed concrete surfaces shall be finished in accordance with Subsection 509.04(g).

(b) **Clay Brick or Concrete Brick.** Brick masonry in circular or curved walls which have a radius of less than 2 feet (0.6 meters) shall have every fifth course stretchers, and the remainder shall have headers; and the thickness of joints shall not exceed 1/4 inch (6 mm) vertical on the inside face or 3/8 inch (10 mm) horizontal. Brick masonry in straight walls—and in walls where the radius of curvature is 2 feet (0.6 meters) or greater—shall have every fifth course headers, and the remainder shall be stretchers; and all joints shall have a thickness not exceeding 3/8 inch (10 mm). Vertical joints in adjacent courses shall be broken approximately half the length or width of the brick, as the case may be.

Lay all brick in a full bed of mortar, and make all joints shoved joints, completely filled with mortar.

NOTE: Buttered joints will not be permitted.

The joints on the inside face or exposed face of the masonry shall be rubbed full and cut as the brick work is built up. Build up the masonry in level courses that are reasonably true to line, grade, and dimension. Use bats only when necessary to close joints, or around irregular openings. Thoroughly wet down all brick immediately before placing it. Complete all work—and finish it—in a careful, professional manner. Thoroughly clean and wet old brick masonry before joining new masonry to it. Where a mortar coating is required, it shall have the minimum thickness shown on the Plans; apply it while the brick masonry is clean and damp, then trowel and retrowel until a uniform, smooth, and relatively impervious surface is obtained.

(c) **Pipe Connections.** Use inlet and outlet pipe of the size indicated on the Plans or as required by the Engineer. Make the end of the pipe flush with the inside of the wall, and tightly seal it in the wall with mortar throughout the circumference of the pipe. Remove the lip of the female end of the pipe and press in and trowel off the mortar flush with the face of the wall.

(d) **Special Curb.** Curbs adjacent to sewer inlets shall be the same kind of concrete as that used in the regular curb, or where no regular curb is being built, shall be Class A concrete. Accurately shape the forms for the curb opening to the dimensions specified on the Plans and secure them in true position. They shall remain in place not less than three days under favorable curing conditions and as much longer as approved by the Engineer under unfavorable conditions.

(e) **Reinforcing Steel.** Place all reinforcing steel in accordance with Section 511.

(f) **Castings, Grating and Drop Inlet Gratings and Special Frames.** With all castings, gratings, or special frames or supports, accurately and rigidly assemble them and place them carefully as shown on the Plans. Bed the frames of all manhole frames and covers as well as inlet frames and gratings in a substantial layer of mortar, with a full bearing, and set these to the exact grade required. Unless otherwise shown on the Plans, make the top of such casting flush with the surrounding surface.

Finish exposed surfaces of special structural steel frames and supports as provided in Section 506.

(g) **Excavation and Backfill.** Excavate to the required depth, and compact the base upon which the manhole, inlet, or junction box is to be set to a firm, even surface. Remove all soft and unsuitable material, and replace it with suitable material, thoroughly compacting it.

(h) **Precast Units.** Bed precast concrete units on a 2 inch (50 mm) minimum thick solid foundation of reasonably clean uniformly graded material capable of being mechanically leveled or leveled by flooding, or floated on a lean grout.

NOTE: No clay balls or cement clumps will be allowed. Anchor the units securely to prevent lateral or vertical movement if any type of sand flooding or grout pouring is used for bedding and/or backfilling. As soon after placement as is practicable,. backfill inlet excavation and thoroughly compact it in incremental lifts or by sand flooding.

Place entrance and exit conduits (round, oval, elliptical, arch pipe, or concrete boxes) with their flowlines as shown on the Plans.

NOTE: Under no circumstances will the elevation or angle be altered to facilitate ease of installation or to make use of an existing blockout.

Set precast concrete inlet units (main boxes and additional opening boxes) flush or slightly below the subgrade to allow free travel of the paving equipment. If precast concrete inlet assemblies are set at subgrade elevation, use a bedded brick (fired clay or concrete) leveling course to bring the inlet assembly to final working grade. A formed and poured concrete collar may also be used. Pin it to the inlet box and additional opening boxes in a manner approved by the Engineer.

All precast concrete units shall provide a soil-tight connection between subassemblies and at each entrance or exit conduit blockout. If a unit is delivered with a blockout placed in

error, or if the Plans are altered to render a blockout unnecessary, clean the hole and fill it with an approved concrete patch. The patch may be from a previous blockout hole securely grouted in place or poured and/or placed using a dry-mix high-strength concrete.

Gasket material used between subassemblies, or between the inlet unit and entrance or exit conduits, shall be chosen from the list of approved adhesive materials maintained by the Department's Materials Division.

When precast manholes are used, properly seal all joints and the base to prevent the passage of water, in accordance with Subsection 613.04(e,) with the following exception: joints shall be made with a single natural rubber or neoprene gasket or 'O' ring, in accordance with the manufacturer's recommendations.

611.05. METHOD OF MEASUREMENT.

The accepted items of this Section will be measured for payment in the following manner:

(a) **Manholes.** Measure manholes—except special manholes, that do not exceed 5 feet (1.5 meters) in depth, as measured from the bottom of the frame cover casting to the flow line of the outlet lead—for payment as manhole and include the walls and the concrete bottom.

(b) **Additional Depth in Manholes.** Measure manholes—except special manholes, exceeding 5 feet (1.5 meters) in depth—as set out above; and measure the depth in excess of 5 feet (1.5 meters) by the vertical foot (meter) of wall and classified for payment as additional depth in manhole.

(c) **Special Manholes.** Measure special manholes by the cubic foot (cubic meters) of wall constructed based on an 8 inch (200 mm) thick wall with deductions made for all openings. Measure concrete used in the base for payment in accordance with Section 509.

(d) **Frames, Covers and Grates.** Measure frames, covers, and grates for manholes and junction boxes by each manhole frame and cover, manhole frame, manhole cover, or manhole cover grate.

Include the cost of support beams for installation in junction boxes in above measured items, instead of measuring them separately.

Include the cost of 'T' handles for locking manhole covers in measurement for the above items. Two handles will be furnished for up to and including 20 locking manhole covers and one for every 20 thereafter.

(e) **Inlets.** Measure inlets by each unit. Measure units for inlet boxes (single or double) and additional curb opening boxes complete in place by inlet per each unit specified by configuration and based upon a specified maximum depth (see current standard drawing for dimensioning).

(f) **Additional Depth in Inlets.** Measure additional depth in inlet for inlet boxes (single or double) and additional curb opening boxes by the vertical foot (meter) for each unit specified by configuration for that portion greater or deeper than the specified maximum depth, as shown on the current standard drawing.

(g) **Frames and Grates for Inlets.** Measure frames and grates for inlets by each inlet frame and grate, inlet frame, or inlet grate, complete in place and accepted.

Do not measure separately (1) the cost of support beams and/or support beams with riser plates and (2) bolts and nuts necessary for installation as shown on the Plans; instead, include them in the above measured items.

(h) **Cast Steel Grate.** With special frames, measure cast steel grates for payment without the cast iron frame for each grate.

(i) **Special Structural Steel Frames.** Measure special structural steel frames by each such frame, complete in place, or by the pound (kilogram) of structural steel frames if so provided on the Plans or in the proposal. Painting will not be measured as a separate item, but the cost of painting shall be included in the price bid for the structural steel frame.

(j) **Junction Boxes.** Measure junction boxes by the cubic foot (cubic meter) of wall constructed, based on an 8 inch (200 mm) thick wall. Deductions will not be made for openings made by pipes having an 18 inch (450 mm) nominal diameter or less.

(k) **Cast Iron Curb Inlets**. Measure cast iron curb inlets by the unit, complete in place.

(l) **Drop Inlet Grates.** Measure drop inlet grates by the unit, complete in place.

(m) **Special Inlet Curb.** Measure special inlet curb for payment by the linear foot (meter), complete in place and accepted.

(n) **Welded Steel Grate.** Welded steel grate will be measured by the unit, complete in place.

611.06. BASIS OF PAYMENT.

Accepted quantities, measured as provided above, will be paid for at the contract unit price as follows:

(A) MANHOLE ..... EACH
(B) ADDITIONAL DEPTH IN MANHOLE ....VERTICAL FOOT (VERTICAL METERS)
(C) SPECIAL MANHOLE ..... CUBIC FOOT (CUBIC METERS)
(D) MANHOLE FRAME AND COVER ..... EACH
(D) MANHOLE FRAME ..... EACH
(D) MANHOLE COVER ..... EACH
(D) MANHOLE COVER GRATE..... ..... EACH
(E) INLET ..... EACH
(F) ADDITIONAL DEPTH IN INLET ..... VERTICAL FOOT (VERTICAL METERS)
(G) INLET FRAME AND GRATE ..... EACH
(G) INLET FRAME ..... EACH
(G) INLET GRATE ..... EACH
(H) CAST STEEL GRATE ..... EACH
(I) SPECIAL STRUCTURAL STEEL FRAMES ..... EACH
(J) JUNCTION BOXES ..... CUBIC FEET (CUBIC METERS)
(K) CAST IRON CURB INLETS ..... EACH
(L) DROP INLET GRATES ..... EACH
(M) SPECIAL INLET CURB ..... LINEAR FOOT (METERS)
(N) WELDED STEEL GRATE ..... EACH

Such payment shall be full compensation for furnishing all materials, equipment, labor, and incidentals to complete the work as specified.

Excavation and backfill will not be measured for payment; instead these costs will be included in the unit price or prices bid for various pay items.

Reinforcing steel will be included as part of the cost of the structure, complete, and will not be measured as a pay item.

SECTION 612

ADJUSTMENT OF EXISTING STRUCTURES

612.01. DESCRIPTION.

This work shall consist of adjusting, altering, relocating, or resetting to the required grade and aligning existing structures, equipment, or appurtenances; this applies to only those structures which are not to be removed or abandoned and which are not the property of a private company, firm, or corporation which would be required to move its own property. All work shall be in accordance with these Specifications and in reasonably close conformity with the lines, grades, elevations, and dimensions shown on the Plans or approved by the Engineer.

When specified on the Plans or shown in the Proposal, this work shall include refurbishing and resetting existing electrical equipment taken from storage.

612.02. MATERIALS.

Materials for use in this work—including the existing item to be adjusted or reset and any new material necessary—shall be specified on the Plans, or if not specified, shall be of the same grade of material as specified elsewhere in these Specifications or for a similar type work, or of a material equivalent to that in the structure being adjusted.

612.04. CONSTRUCTION METHODS.

(a) **General.** The materials and workmanship necessary in raising, lowering, or otherwise adjusting or resetting existing structures shall conform to the requirements of the Plans and Specifications for the class of work involved, or as approved by the Engineer. Rebuild existing structures in accordance with the Plans and Specifications. If the structure is in the pavement, complete the final adjustment to grade after the final surface course has been placed.

Guard against damage or breakage to any portion of the structure or appurtenance to be altered, removed, or reset. Any damage or breakage due to failure to properly protect such structure or appurtenances shall be repaired or replaced at the Contractor's expense.

At the Contractor's expense, transport items to be reset from the storage site, and reset them as shown on the Plans. Repair or replace any items damaged as a result of failure to properly transport, adjust, or reset the structure or appurtenance. If the Plans specify an existing item to be modified, cleaned, repaired, or otherwise made ready for reuse, do this work in accordance with the Plan requirements, prior to resetting them at the planned location.